FEDERAL RESERVE BANK
OF SAN FRANCISCO

ECONOMIC REVIEW

FALL 1978

INFLATION, UNCERTAINTY AND CAPACITY UTILIZATION

Room for Growth: Speeds of Adjustment of Labor and Capital

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Unemployed labor and unused capital stock provide two measures of the available economic capacity at the nation's disposal. In the past, the two have generally followed the same path, and most analysts have treated them as roughly interchangeable measures of the amount of pressure on resources. In recent years, however, that relationship has come to appear considerably weaker than before.

In the summer of 1978, capacity utilization approached 85 percent of the nation's capital stock—relatively tight in terms of the post-World War II average of 81 percent—while the unemployment rate stood at 5.9 percent of the labor force—relatively slack in terms of the postwar average of 5.3 percent. Thus the two measures have been providing different signals of the amount of resource pressure in the economy. The recent level of capacity utilization suggests that we are already approaching full resource use, so that new supply pressures could cause accelerating inflation. Indeed, on two earlier occasions, capacity utilization went from 85 percent to the cyclical peak of 87-88 percent very rapidly, within the space of two to three quarters. But the recent unemployment rate suggests that fiscal and monetary stimulus could be applied for a protracted period with little danger of accelerating inflation.

Which of these conflicting signals is correct? Most recent studies have tried to show that the signals may, in fact, not conflict as much as seems apparent, because structural changes in the economy have made it difficult to compare the measures over time. According to some labor-market studies, the shifting age-and sex-composition of the labor force have tended to increase the economy's "normal" rate of unemployment, so that the current level is actually close to "full employment."[1] According to some capacity studies, the OPEC-caused upsurge in oil prices has tended to lower the nation's potential capacity to produce.[2]

In this article, we argue that it is not necessary to resort to these structural arguments to explain the current divergence of the unemployment and capacity-utilization rates. Rather, the two markets need not reach full-resource use at the same point in business expansions, because capital and labor supplies exhibit different cyclical patterns. New additions to the capital stock are concentrated in the mature-recovery portions of cyclical expansions, while new additions to the labor force are concentrated in a brief period following cyclical troughs. Short-term movements in the capital stock, unlike movements in the labor force, are largely dominated by shifts in expected output. Firms make substantial adjustments to their desired capital-output ratios in short periods of time, through movements in investment which are substantially faster than the adjustments they make to changes in the labor force-output ratio.

The standard Keynesian aggregate-demand model includes only one factor market—usually the labor market—but in this article we add a second factor market—the capital market. Our rationale is that capital normally adjusts more rapidly than labor to changes in economic conditions. The single-factor model has adequately described most early-recovery periods, when both labor and capital were in ample supply. Again, the single-factor model has adequately described such mature recovery periods as 1956-57 and 1967-69, which were capital-constrained with high levels of capacity utilization, and also labor-constrained with quite low levels of unemployment. In other periods, however, that model has proved to be an inadequate description of the cyclical process.

The two-factor model provides a better explanation of three brief, but important, periods of transition to full employment—in 1955, 1965

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and 1973. More importantly, that model may be relevant to the period immediately ahead, which might be marked by capital constraints but also by adequate supplies of labor.[3] Capital utilization is already quite high, so that strong real growth over the next half-year could place the economy under significant capital constraints. But the unemployment rate at that point could still be close to 6 percent, which means that the economy could sustain a capital-constrained expansion for at least a year before the labor market showed severe signs of tightness.

In such a period, high levels of capacity utilization would tend to stimulate rapid investment, prolonging the business expansion. This investment then would generate strong demands for credit, applying substantial pressure on interest rates. But it would be wrong to interpret rising rates in this case as indicating an excessive tightness of monetary policy—which might be deemed inappropriate in view of the likelihood of continued high unemployment. Indeed, if the monetary authorities resisted the upward trend in interest rates, they could ratify the demand pressures from the capital-investment expansion and thus set off a new spurt of inflation. Consequently, policymakers should monitor closely the signals from both the capital and labor markets over the coming year.

Section I of this article describes the factor-market regularities which tend to exist both in a transition period where there is an excess supply of only the labor input to production, and in a mature-expansion period where there are no excess factor supplies. The following section discusses the implications of these factor-market movements for the cyclical changes in fixed investment, labor-force growth and interest rates. Section 3 discusses the derivation and operation of the two-factor model, and the concluding section describes the implications of this analysis for current policy.

There are two special problems in treating the published unemployment and capacity-utilization rates as roughly equivalent measures of the degree of pressure on the capital and labor markets. These should be noted at the outset, because their treatment in this article affects the analysis at several points.

1. Measures of excess capacity are available for manufacturing only. The non-manufacturing "service" industries have no comparable measure, largely because of the ambiguity of the concept as applied to these industries. We here assume that the cyclical timing, though not the amount of fluctuation, in the size of the capital stock in service industries is much the same as in manufacturing.

2. Because excess capacity is measured for manufacturing only, the obvious labor-market comparison is with the unemployment rate in manufacturing. In fact, those rates do have very similar cyclical patterns, with both tending to reach cyclical lows before the overall unemployment rate reaches its cyclical low. However, they do so for very different reasons. The early trough in capacity utilization occurs because rising demand causes producers to expand their capital stock to meet this demand.

Other things equal, a larger capital stock means lower capacity utilization. The early turning point in manufacturing unemployment occurs because the growing availability of good-paying jobs in manufacturing brings about an increase in the supply of manufacturing labor. Thus manufacturing unemployment is a poor guide to the general pressure on the labor market, so that we may assume that the overall unemployment rate is the appropriate measure of the state of the labor market.

Because manufacturing capacity utilization appears to be an adequate measure of overall capital usage, and because the overall unemployment rate appears to be the best measure of labor supply conditions, we can make the direct factor-market comparison provided in Section I without danger of involving an "apples and oranges" type of inappropriate comparison.

I. Cyclical Behavior of Factor Utilization Rates

First, let us note some intrinsic weaknesses in the factor-utilization data used in this section. These numbers contain ambiguities. Both capacity-utilization data and unemployment data are based on surveys, one of manufacturers and the other of households. The questions asked in the household survey are straightforward. The interviewer asks whether a person had

worked, or had looked for work, during the survey month. Even so, the survey fails to pick up such phenomena as "discouraged workers"—people counted by the survey as having dropped out of the labor force entirely, but who in fact have simply given up all hope of finding a job.

The analogous survey problem for capacity utilization concerns marginal plant and equipment. In the manufacturing survey, business firms are asked to assess the degree of their capacity usage, compared to full use under "normal operating conditions." Each must decide whether pieces of hopelessly obsolete equipment—perhaps kept around to meet peak-load problems—qualify as part of his "normal" capacity. The answer will vary from firm to firm, so the concept of capacity utilization is intrinsically somewhat fuzzier than that of the unemployment rate.

As noted above, we here assume that service industries' economic behavior differs from manufacturers' by at most a scale factor. The assumption may not be entirely true, because many services are substantially less cyclical than manufacturing. The analysis in Section III thus will be supported by other evidence—for example, the cyclical behavior of such series as investment and interest rates. The first step in this approach, however, must be an examination of the cyclical character of movements in the factor-utilization rates themselves.

Three postwar business expansions have reached full maturity—in 1954-57, 1960-69 and 1970-73 (Table 1)[4]—and the current period may yet reach the same stage. Transition periods are defined as those when capacity utilization first approaches its peak level but when unemployment still remains above its cyclical lowpoint. (Rather arbitrarily, the start of the transition period is dated from the point when the capacity-utilization rate first exceeds 84½ percent.) Mature-expansion periods are defined as those when capacity utilization remains high, and unemployment as well has reached its cyclical low. This distinction between transition and mature-recovery periods is most evident in the long 1954-57 and 1961-69 expansions (Chart 1). Still, it is evident even in the relatively short 1970-73 expansion, when the period of low cyclical unemployment continued over five full quarters.[5]

In all of the post-Korea expansions, the rise in capacity utilization was slightly faster than the fall in unemployment (allowing for the difference in scale of the two series). In all except the abortive 1958-59 recovery, capacity utilization reached its peak before unemployment reached its trough. In each early-recovery period, unused capacity and unemployment declined almost as rapidly as they rose during the preceding recession period, that process continuing to about the seventh quarter of recovery.[6]

The 1970-73 expansion represented a partial exception to this pattern, however. Real GNP[7] and capacity utilization rose during the early part of that expansion at about the same rate as in earlier cycles, but the unemployment rate did not drop appreciably below the 6.0-percent recession-trough figure until late 1972, six quarters after that trough. The jobless rate then averaged 4.8 percent during the mature-recovery period—a full percentage point above the average for the two previous mature recoveries. This difference in movement is attributable, first, to the post-Vietnam reversal of the artificial lowering of the civilian labor force associated with that conflict, and second, to the influx of unskilled

Table 1
Factor Usage and the Rate of Inflation in Three Expansions

	Capacity Utilization			Unemployment Rate			Inflation Rate		
	1954-57	1961-69	1970-73	1954-57	1961-69	1970-73	1954-57	1961-69	1970-73
Year before transition	80.1	82.8	83.1	5.5	5.6	5.8	1.9	1.4	4.5
Transition period*	86.0	87.2	86.5	4.6	4.9	5.2	2.9	2.0	5.0
Mature expansion**	86.2	87.4	86.9	4.1	3.7	4.8	3.3	4.4	9.1
Year after end mature expansion	75.3	78.2	73.1	6.5	5.0	7.0	1.3	5.1	9.8

* Dating of transition periods: 1955I-1955II; 1963IV-1965IV; 1972IV-1973II.
** Dating of mature expansions: 1955III-1957III; 1966I-1969IV; 1973III-1974III.

younger workers and women workers into the labor force.

A systematic difference between the two series has typically emerged after the early-recovery period.[8] On average, capacity utilization stopped rising after the seventh quarter of recovery, while unemployment continued to fall slowly throughout the expansion. All of the complete post-Korea expansions—again with the exception of the abortive 1958-59 recovery—went through such a transition period and then entered a mature-expansion period marked by both full employment and full capacity utilization.

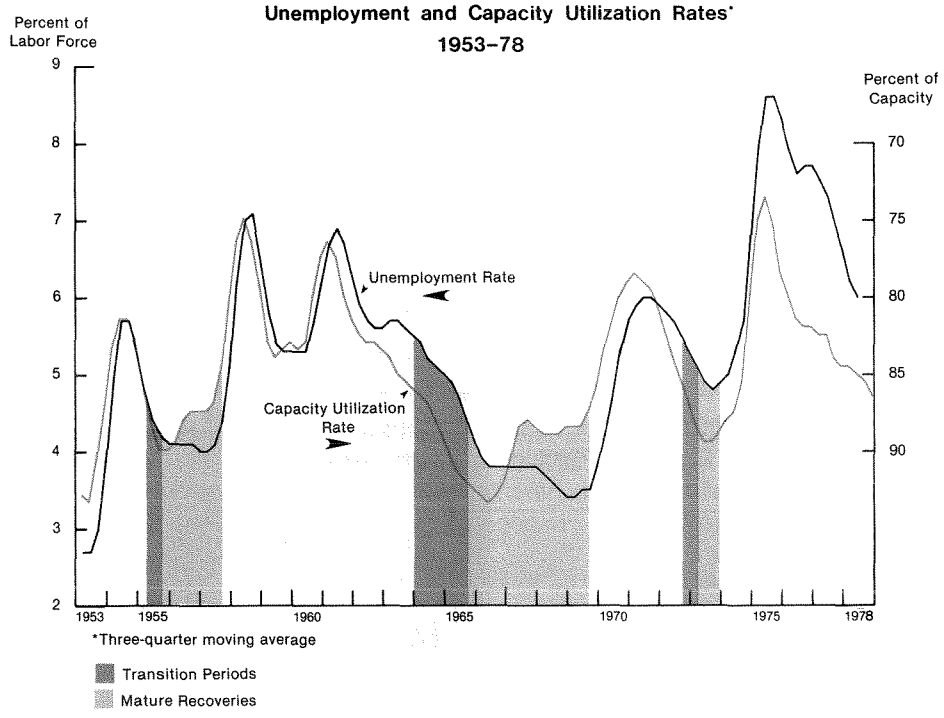
A striking regularity has been the narrow range of movement of capacity utilization in both the transition and mature-recovery period of the average cycle. This is doubly striking in view of the fact that the capacity utilization rate exhibits five times as much overall cyclical variation as the unemployment rate.[9] Yet given its smaller relative movement, the unemployment rate clearly has varied more than the capacity-utilization rate from cycle to cycle. A substantial difference can be observed between the 3.7-percent average jobless rate of the 1966-69 mature recovery and the 4.8-percent rate of the 1973-74 mature recovery. This variation underlines the importance of structural elements, such as the demographic factors cited above, in determining the level of full employment. The labor market thus contains an element of long-period adjustment to changing demographics as well as a normal cyclical adjustment—as we are certain to see over the next decade as those earlier factors begin to reverse themselves.

Another strong regularity during these cycles has been the tendency for full-employment periods to determine the timing of accelerated-inflation periods. Both of the major inflationary bursts—in 1966-69 and 1973-74—occurred during periods of mature expansion. In both cases, the labor and capital markets showed considerable tightness, with little variation in either the capacity-utilization rate or the unemployment rate. Price acceleration also appeared to be relatively large during the 1956-57 mature expansion, although it tended to be swamped by the generally declining trend in the inflation rate which marked the 1950's.[10]

Chart 1

Unemployment and Capacity Utilization Rates*

1953–78



II. Cyclical Patterns of Factor Growth

As we have seen, the capital and labor markets exhibit some difference (although sometimes a modest difference) in their cyclical rates of adjustment. This distinction may be traced to the pronounced difference in the cyclical growth patterns of the underlying stocks—business fixed capital and the labor force. That difference in turn probably reflects different treatments of fixed and variable production inputs. Capital in principle is a hybrid kind of factor; large quantities of available capital will be left unused in recessions, but will then be brought back into use during mature recoveries—depending on the level of aggregate demand and hence on the quantities available of variable production factors. However, this characteristic may not be shared to the same extent by the labor input.

Fixed factors are those production inputs whose available quantities are relatively independent of current rates of production. The desired stock of a fixed asset responds primarily to changes in the expected flow of services the asset will yield over a long span of time. Asset holdings should adjust slowly to changes in relative prices as all expected future flows of services become adjusted to the current market rate of return. Because of the slowness of adjustment, fixed-factor markets will often appear to be in a state of excess supply, yet with no significant decline in rates of return. To explain this, we may assume that the expected future rate of return is high enough to make current owners of unused assets willing to continue to hold them. Firms will not scrap unemployed capital as long as they expect those assets to be profitable in the future; instead, they will simply report those assets as idle capacity.

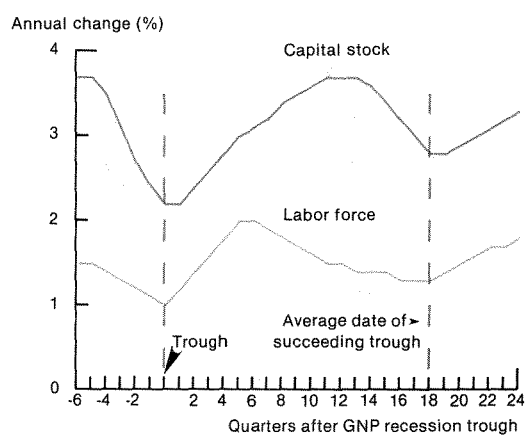
In principle—although not necessarily in practice—the same argument applies to the labor market.[11] We may assume that expected wage rates are high enough to persuade current owners of unused skills—the unemployed—to be willing to continue in the labor force. In the labor market as in the capital market, these resources are available factors for further expansion of the economy.But from the overall view of society rather than the limited view of individual firms, labor is the major long-run fixed factor in the economy. Rapid scrappage can reduce a stock of obsolete capital fairly quickly, but the same cannot be said for a group of skilled workers who are displaced by new technology.

According to the evidence of the two strongest expansions (1954-57 and 1961-69), capacity utilization and labor utilization tend to move differently in the later stages of expansion, with capacity utilization turning down long before the unemployment rate reaches its low point (Chart 1). Because the two series tend to move together in the preceding recession and early-expansion phases, their divergent behavior in later stages of the cycle suggests substantially different cyclical behavior on the part of the underlying stocks of labor and capital (Chart 2). The two series exhibit similar cyclical amplitudes; the labor force increases over the cycle by about 1 percent of the underlying stock, while the amount of investment increases by about 1½ percent of its stock. However, their patterns of movement vary considerably.

All of the cyclical increase of the labor force typically occurs in the first year of expansion, and is then followed by a prolonged period of stagnation or decline. Thus the most substantial growth occurs in the early-recovery period, when the level of aggregate demand (though not its growth rate) is still low. This pattern reflects the underlying secular nature of labor-force growth—plus a discouraged-worker effect, with some potential workers leaving the labor force as

Chart 2

Cyclical Changes in Capital Stock and the Labor Force
(Average of five post war cycles)



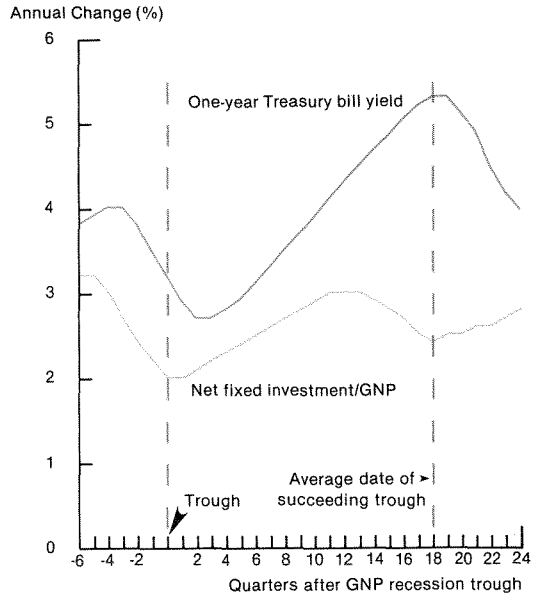
market conditions worsen, but then returning to the labor force as demand picks up in the early-recovery phase. Investment demand, in contrast, is strongly pro-cyclical, so that its movements cannot be explained in the same way as the movements of the labor force. Again, its movements cannot be easily explained in terms of interest-rate effects (Chart 3), because interest rates, like investment, move in a strongly pro-cyclical fashion. (Interest rates generally peak at the GNP peak, and reach a low point just after the GNP trough.) Interest rates can significantly affect investment, of course, primarily by helping to determine the best long-run ratio of capital to output, but over the cycle, the level of output tends to have more effect than interest rates on new investment spending. Thus investment tends to be concentrated in the transition and mature-recovery periods of the cycle, when by definition the highest levels of output occur.

The transition and mature-recovery periods are similar because both are periods of heavy investment, but they differ in respect to patterns of inflation—with accelerated inflation being evident only in the mature-recovery phase. This distinction may reflect the fact that capital is the only effective factor constraint on continued output growth during the transition period,

Chart 3

Cyclical Changes in Investment and Interest Rates

(Average of five post war cycles)



whereas both capital and labor act as factor constraints during the mature-recovery phase. The different behavior of the economy in these two periods implies that there is a systematic difference in the economic response to the two kinds of factor constraint.

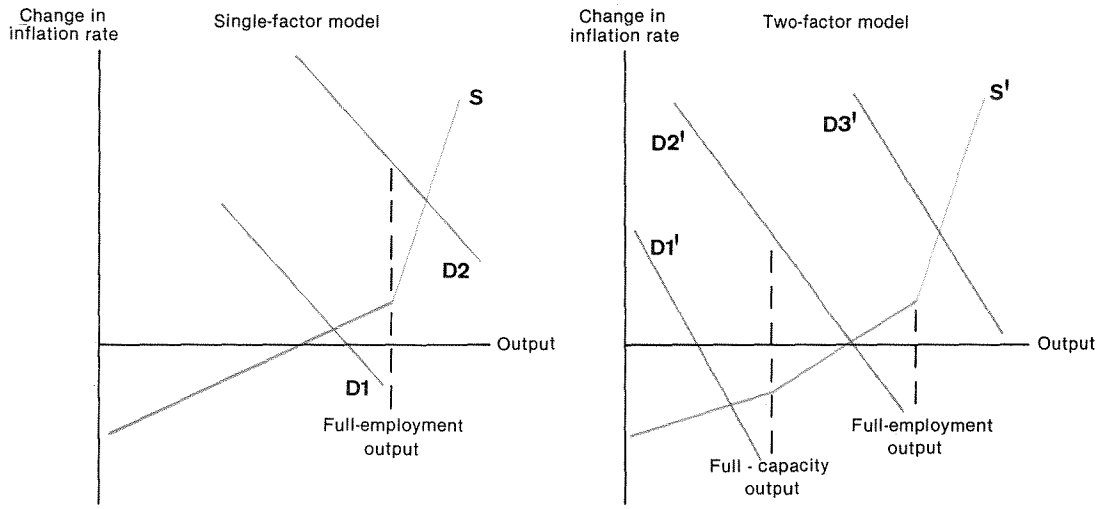
III. Aggregate Demand and Supply

In a single-factor model, with the unemployment rate used as a general measure of the amount of demand pressure, the economy may be faced with an aggregate supply function as shown in the left panel of Chart 4. If output is below its full-employment level, expansive monetary and fiscal policy will tend to increase aggregate demand and reduce unemployment (shifting demand from D1 toward D2), but with relatively small inflationary consequences because of the availability of excess factor resources. If output is above its full-employment level, however, expansive aggregate-demand policy will have a greater impact on prices than on output, because of the lack of available factor resources.

This single-factor model may be incomplete in certain circumstances, because of the different rates of adjustment in the capital and labor markets. Full capacity utilization will occasionally be reached before full employment, leading to a supply function such as that shown in the right panel of Chart 4. If output is below the full-capacity level, neither capital nor labor will act as a constraint. In that case, expansionary aggregate-demand policy will tend to increase income, lower unemployment, and increase capacity utilization. As in the single-factor model, the factor markets would generate little inflationary pressure within this range of income.

When income reaches the full-employment level, however, both available capital and available labor act as constraints on real output, although capital does so only by requiring a switch of resources away from consumption and toward investment. When both labor and capital are fully utilized, expansive monetary and fiscal policy cannot be expected to produce further large additions to output. At that point, the only effective way of increasing real income will be a

Chart 4
Aggregate Supply and Demand

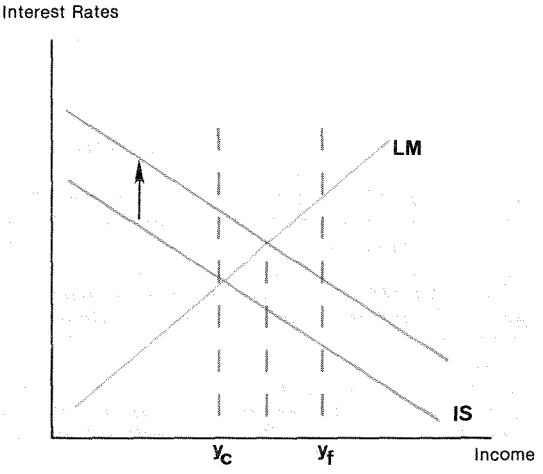


structural policy, designed to shift the supply curve itself to the right.

Just as in the single-factor model, if both labor and capital are less than fully employed (at aggregate-demand line D1′), we may experience little acceleration and perhaps even some deceleration of inflation. Inflation in actuality tends to decelerate at low levels of aggregate demand—that is, in late recession and early recovery. But the slope of the aggregate supply schedule S′ is quite low where it is crossed by the low-aggregate-demand line D1′, which implies that a large shortfall in aggregate demand is required to produce a modest decrease in the inflation rate.[12] In contrast, the slope of the aggregate-supply schedule is steep where it is crossed by the high-aggregate-demand schedule D3′, which implies that the policy impact on the inflation rate mostly occurs during the mature-recovery period of very high aggregate demand. Also, as we argued in Section I, a transition period exists between the early-recovery and mature-recovery periods, which is marked by a low transmission of inflation. We can now see that this is the portion of the aggregate-supply schedule crossed by the middle aggregate-demand schedule D2′.

Between the stages of full capacity and full employment, further growth depends on an increased demand for investment goods at any level of interest rates. As income approaches y_c, the full-capacity level of income, the investment function tends to shift upward as business increases its estimate of the future demand for output (Chart 5). This in turn shifts upward the IS schedule, the total demand for goods and services. We can then determine a complete solution by adding the LM curve, which indicates the similar trade-off determined in the financial markets. As IS shifts upward on reaching full capacity (y_c), income and investment both increase, and so do interest rates.

Chart 5
Income and Interest Rates



IV. Implications for Current Policy

In this paper, we have emphasized the fact that the capital market adjusts more rapidly than the labor market over the cycle, which implies that a transition phase exists between the period of full capacity use and the period of full employment. This phase is relevant to us because the economy now seems to be in the midst of just such a transition, moving toward a mature-recovery period. In the past, capital accumulation has been significant only in the transition and mature-recovery periods, and not in the earlier stage of expansion. Thus, if we failed to enter these cyclical phases, we might experience a permanently reduced rate of growth of the capital stock and hence of productivity. On the other hand, a mature recovery carries inflationary seeds of destruction within itself, so that we must recognize the warning signals and avoid overly full use of the factor markets.

The upward shift in the investment schedule which typifies the transition period is the clearest guide to the policy signals which can be anticipated in the advanced stages of recovery. First, we should look for a rapidly rising ratio of investment to output. Secondly, we should recognize that any given setting of fiscal and monetary policy will produce more inflation than it did earlier in the recovery. The danger at such a point is that policymakers will resist the interest-rate increases which characterize the transition, and thereby overstimulate the economy and bring it rapidly from a wasteful state of unused resources to an inflationary state of overfull employment. To some extent, this is what happened in the closing stages of both the 1954-57 and 1970-73 expansions.[13]

In both 1954-57 and 1970-73, the transition was quite brief, with capacity utilization moving from 84½ percent to cyclical peaks in the 87-88 percent range within two to three quarters. Because of the brevity of those transition periods, the bulk of each cycle's net capital accumulation occurred in the mature-recovery period. In contrast, the 1964-65 transition period was prolonged more than two years by shifting but generally tight monetary policy measures which permitted both higher interest rates and a higher investment-output ratio.

The current recovery appears to be in its own transition phase. The unemployment rate, at slightly below 6 percent, is still quite high by the standards of earlier cycles. Yet interest rates have moved sharply upward, with Treasury bill rates up almost 200 basis points to date this year, and with the bill-futures market expecting even further increases. Meanwhile, the investment-output ratio has begun to rise, from a static level of 9.7 percent in 1977 to 10.2 percent in the second quarter of 1978. That combination of circumstances suggests that it would be wise to avoid overstimulating the economy during this transition phase. In particular, the rising level of (present and prospective) interest rates appears to be an integral component of real growth in a capital-constrained economy. If such increases are not resisted by policy, and if monetary growth is kept to a steady path, the recovery should be able to continue for some time without a further acceleration of inflation.

FOOTNOTES

1. See George Perry (1974) and Michael Wachter. (1977)
2. See Robert Rasche and John Tatom. (1977)
2. The structural problems are important, as has been seen in Rose McElhattan's article in this **Review** (1977). But the evidence should not be overemphasized. The lowest post-Korea unemployment was not reached in the expansions of the 1950s, but as recently as 1969.
4. The investment, labor force, and interest-rate implications of the factor-usage rates are discussed in the next section.
5. The dates where the labor market began to weaken are chosen as the endpoints of mature recoveries. Because of the short lag between GNP growth and labor-market growth, the 1960-69 recovery is one quarter longer and the 1970-73 recovery three quarters longer than is indicated by the official National Bureau data.
6. A more detailed examination of the recession and early-recovery relation between the two factor-market measures was presented in the Spring 1977 issue of the **Review**. The present article focuses on this relation in transition and mature recovery.
7. Real GNP has grown at an annual rate of almost exactly 5 1/2 percent in the first eight quarters of **each** of the five most recent business-cycle recoveries.
8. The narrow difference in the cycle averages accounts for the general assumption that the two measures are interchangeable. Statistical methods based on long spans of time must account first and foremost for large swings in behavior. In the factor markets, these are the

large movements in factor use centered on the recession trough of the business cycle.

9. The average increase in unemployment in the last five recessions was 3.1 percent of the labor force; the average decline in capacity utilization was 14.9 percent of total utilization. The ratio of the two—4.8—measures the relative cyclicity of the two.

10. Monetary policy was generally restrictive throughout the Eisenhower years. Also, the end of Korean War price controls in the Spring of 1953 pushed the inflation above what might have been expected during the 1953-54 period of recession and early recovery.

11. Adjustment does occur in such markets. If low employment persists for long enough, some of the unemployed will lower their estimates of their future earning power and either leave the labor force or lower their wage offer. If low capacity utilization persists, some firms will not replace depreciated plant and equipment. Such changes in expected future returns to capital and labor may also produce long-term stability of factor-usage rates in these markets. A reduced expected return to capital lowers the desired capital stock and makes the hiring of labor more attractive, and thus creates an incentive to shift to more labor-intensive technology over the long term. Thus the notion of a fixed factor is a short-term concept; in the long term, all inputs to production are variable. But a large difference remains in the way short-term fixed and variable factors affect the nation's effective economic capacity.

12. R.J. Gordon (1976), in a recent survey of the Phillips Curve literature, argued that theory provides scant guidance as to the slope of the aggregate-supply schedule. He also noted that empirical economists have become steadily more gloomy concerning the strength of this trade-off.

13. This is not to say that policy of itself ended either expansion. Rather, policy led to a state of extremely high aggregate demand, and thus made the economy vulnerable to any sort of downward shock to either aggregate supply or demand. The 1973 oil-supply shock, for instance, marked the end of recovery, although full employment had not been reached by mid-1973.

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